CLAIMS

1. A method of operating a fuel cell including an anode, a cathode, a first passage, and a second passage, wherein the anode is disposed in the first passage and the cathode is disposed in the second passage, comprising:

(i) producing a non-explosive gaseous feed consisting of (i) at least one oxidizable component having a greater tendency to undergo oxidation relative to the anode, and (ii) a remainder, wherein the remainder is the predominant component in the gaseous feed and consists essentially of water vapor; and

(ii) introducing the non-explosive gaseous feed to the first passage to form a first gaseous stream flowing through the first passage when the anode realizes a temperature effective to facilitate deteriorative oxidation of the anode in the presence of an oxidizing agent.

2. The method as claimed in claim 1, wherein the concentration of the water vapor in the gaseous feed is greater than 50% by volume based on the total volume of the gaseous feed.

3. The method as claimed in claim 2, wherein the concentration of the at least one oxidizable component is less than the minimum concentration necessary to render the gaseous feed potentially explosive at the effective temperature.

4. The method as claimed in claim 2, wherein the concentration of the at least one oxidizable component is less than the lower flammability limit of the at least one oxidizable component.

5. The method as claimed in claim 2, wherein the concentration of the at least one oxidizable component is effective to mitigate deteriorative oxidation of the anode.

6. The method as claimed in claim 5, wherein the concentration of the at least one oxidizable component is effective to substantially prevent deteriorative oxidation of the anode.

7. The method as claimed in claim 6, wherein the at least one oxidizable component is selected from the group consisting of hydrogen, alcohols, aldehydes, ketones, esters, organic acids, ammonia, hydrazine, and hydrocarbons.

8. The method as claimed in claim 7, further comprising evaporating an aqueous mixture consisting essentially of water and the at least one oxidizable component to produce the gaseous feed.

9. The method as claimed in claim 8, wherein the anode comprises nickel.

10. The method as claimed in claim 9, wherein the effective temperature is 400°C.

11. The method as claimed in claim 10, further comprising flowing a second gaseous stream through the second passage, the second gaseous stream including oxygen, while contemporaneously flowing the first gaseous stream through the first passage.

12. The method as claimed in claim 11, wherein the at least one oxidizable component is methanol and the concentration of methanol in the aqueous solution is less than about 2.4% by weight based on the total weight of the aqueous solution.

13. A method of operating a fuel cell including an anode, a cathode, a first passage, and a second passage, wherein the anode is disposed in the

first passage and the cathode is disposed in the second passage, comprising:

(i) progressively heating the first fluid passage;

(ii) producing a non-explosive gaseous feed consisting of (a) at least one oxidizable component having a greater tendency to undergo oxidation relative to the anode, and (b) a remainder, wherein the remainder is the predominant component in the gaseous feed and consists essentially of water vapor; and

(iii) purging the first passage with the gaseous feed when the temperature of the anode is above a temperature effective to cause deteriorative oxidation of the anode in the presence of an oxidizing agent.

14. The method as claimed in claim 13, wherein the concentration of the water vapor in the gaseous feed is greater than 50% by volume based on the total volume of the gaseous feed.

15. The method as claimed in claim 14, wherein the concentration of the at least one oxidizable component is less than the minimum concentration necessary to render the gaseous feed potentially explosive at the effective temperature.

16. The method as claimed in claim 14, wherein the concentration of the at least one oxidizable component is less than the lower flammability limit of the at least one oxidizable component.

17. The method as claimed in claim 14, wherein the gaseous feed includes the at least one oxidizable component in a concentration effective to mitigate deteriorative oxidation of the anode.

18. The method as claimed in claim 17, wherein the gaseous feed includes the at least one oxidizable component in a concentration effective to substantially prevent deteriorative oxidation of the anode.

19. The method as claimed in claim 18, wherein the at least one oxidizable component is selected from the group consisting of hydrogen, alcohols, aldehydes, ketones, ammonia, hydrazine, and hydrocarbons.

20. The method as claimed in claim 19, further comprising evaporating an aqueous mixture consisting essentially of water and the at least one oxidizable component to produce the gaseous feed.

21. The method as claimed in claim 20, wherein the anode comprises nickel.

22. The method as claimed in claim 21, wherein the effective temperature is 400°C.

23. The method as claimed in claim 22, further comprising flowing a second gaseous stream through the second passage, the second gaseous stream including oxygen, while contemporaneously purging the first passage with the gaseous feed.

24. The method as claimed in claim 23, wherein the at least one oxidizable component is methanol and the concentration of methanol in the aqueous solution is less than about 2.4% by weight based on the total weight of the aqueous solution.

25. The method as claimed in claim 24, further comprising, after (iii), terminating the purging of the first passage by the gaseous feed and flowing a gaseous fuel through the first passage when the temperature

within the first fluid passage is sufficiently high such that the gaseous fuel is not potentially explosive when disposed in the first passage.

26. A method of operating a fuel cell including an anode comprising nickel, a cathode, a first passage, and a second passage, wherein the anode is disposed in the first passage and the cathode is disposed in the second passage:

(i) producing a non-explosive gaseous feed comprising water vapor and at least one oxidizable component having a greater tendency to undergo oxidation relative to the anode by either of:

(a) evaporating an aqueous mixture comprising the at least one oxidizable component; or

(b) evaporating a source of water to produce the water vapor, and combining the water vapor with the at least one oxidizable component; and

(ii) purging the first passage with the gaseous feed when the anode realizes a temperature effective to facilitate deteriorative oxidation of the anode in the presence of an oxidizing agent.

27. The method as claimed in claim 26, wherein the non-explosive gaseous feed is produced by evaporating the aqueous mixture including the at least one oxidizable component.

28. The method as claimed in claim 27, wherein the concentration of the water vapor in the gaseous feed is greater than 50% by volume based on the total volume of the gaseous feed.

29. The method as claimed in claim 28, wherein the concentration of the at least one oxidizable component is less than the minimum concentration

necessary to render the gaseous feed potentially explosive at the effective temperature.

30. The method as claimed in claim 28, wherein the concentration of the at least one oxidizable component is less than the lower flammability limit of the at least one oxidizable component.

31. The method as claimed in claim 28, wherein the concentration of the at least one oxidizable component is effective to mitigate deteriorative oxidation of the anode.

32. The method as claimed in claim 31, wherein the concentration of the at least one oxidizable component is effective to substantially prevent deteriorative oxidation of the anode.

33. The method as claimed in claim 32, wherein the at least one oxidizable component is selected from the group consisting of hydrogen, alcohols, aldehydes, ketones, ammonia, hydrazine, and hydrocarbons.

34. The method as claimed in claim 33, wherein the anode comprises nickel.

35. The method as claimed in claim 34, wherein the effective temperature is 400°C.

36. The method as claimed in claim 35, further comprising flowing a second gaseous stream through the second passage, the second gaseous stream including oxygen, while contemporaneously purging the first passage with the gaseous feed.

37. The method as claimed in claim 36, wherein the at least one oxidizable component comprises methanol.

38. The method as claimed in claim 37, wherein the concentration of methanol in the aqueous solution is less than about 2.4% by weight based on the total weight of the aqueous solution.

39. The method as claimed in claim 27, wherein the evaporation is a flash evaporation.

40. The method as claimed in claim 38, wherein the evaporation is a flash evaporation.

41. A fuel cell system comprising:

a fuel cell including an anode, a cathode, a first passage, and a second passage, wherein the anode is disposed in the first passage and the cathode is disposed in the second passage;

means for evaporating an aqueous mixture including at least one oxidizable component to form a gaseous feed; and

means for delivering the gaseous feed to the first passage to form a first gaseous stream flowing through the first passage and effective in mitigating corrosion of the anode.

42. A fuel cell system comprising:

a fuel cell including an anode, a cathode, a first passage, and a second passage, wherein the anode is disposed in the first passage and the cathode is disposed in the second passage:

an evaporator, fluidly communicating with the first passage, for evaporating an aqueous mixture including at least one oxidizable component to form a gaseous feed; and

a controller, communicating with the fuel cell for receiving an anode corrosion indication, and configured to deliver the gaseous feed to the first

passage to form a first gaseous stream flowing through the first passage in response to the anode corrosion indication within the fuel cell.

43. The fuel cell system as claimed in claim 42, wherein the controller is coupled to a temperature sensor for measuring a temperature within the fuel cell, and wherein the controller is configured to effect the delivery of the gaseous feed at a predetermined temperature.

44. The fuel cell system as claimed in claim 43, wherein the controller is coupled to a motive means configured to effect the delivery of the gaseous feed, and wherein the controller is configured to actuate the motive means to effect the delivery of the gaseous feed at the predetermined temperature.